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Airships for the 1990s?

by

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In the minds of most people, the usefulness of lighter-than-air (LTA) craft ended on a rainy May evening in 1937 when the German Zeppelin *Hindenburg* (LZ-129) dramatically burst into flames and crashed before a horrified crowd at the Naval Air Station in Lakehurst, New Jersey. This was captured on film and audiotape by the small army of newsmen who unflinchingly recorded the death throes of the 800-foot long airship. In the weeks following the crash, millions of movie viewers around the world were electrified by the sight of the flaming Zeppelin slowly settling to rest amid the screams of passengers, crew members, and on-lookers. Most of us have since seen it at least once on television.

In terms of modern air crashes, the death toll was modest, a mere 36, but in 1937 this was the largest number of people yet to die in a crash involving a single aircraft. The actual cause of the disaster has never been identified, and even today the debate continues between those historians who believe the *Hindenburg* fell victim to anti-Nazi sabotage and those who believe natural causes (such as static electricity or lightning) ignited the airship's six-million cubic feet of hydrogen.

While the cause of the crash is still debatable, the results were immediately evident. The Deutsche Luftschiff Reederei, the German company which operated the giant airships, promptly grounded the *Hindenburg's* highly successful older "sister," the *Graf Zeppelin* (LZ-127) which was returning from a flight to South America at the time of the Lakehurst crash. The *Graf* carried the last commercial passenger ever to fly in a rigid airship, and ended a long and successful career which had seen the airship across the South Atlantic 140 times, the North Atlantic seven times, and the Pacific once. By the time she was retired in 1937 she had flown for over 16,000 hours, covering over a million miles while carrying 13,100 passengers.

Despite this impressive record, the Nazi regime feared that another crash could tarnish the "invincible" image of the Third Reich, and the *Graf Zeppelin* was permanently taken out of service and put on public display in a hangar. With the demise of Germany's passenger-airship business, the Luftwaffe assumed control of the last remaining operational rigid airship in the world, the *Graf Zeppelin II* (LZ-130), which was identical in size to the *Hindenburg*. In 1938 and 1939, LZ-130 was used to conduct some of the world's first airborne electronic intelligence missions.

The Germans had become aware of the construction of a number of tall towers along the British coastline facing the European continent. Anxious to determine the military potential of these sites, the Luftwaffe outfitted the LZ-130 as a flying electronics laboratory. The airship made a number of flights along the British coastline to intercept and analyze the emission from the mysterious towers. But the

Germans failed to learn the secret of the towers, and of the newly invented radar system they supported. The *Graf Zeppelin II* was soon broken up for scrap, with her skeleton being melted down and reshaped into airplane parts.

Most people assume that after the *Hindenburg* crash there was little lighter-than-air activity except for the Goodyear blimp's annual appearance over the Rose Bowl. In reality, however, between 1937 and 1962 the US Navy successfully operated over 200 non-rigid "blimps," all filled with helium, a gas which does not burn.

During World War II, blimps from 14 squadrons escorted over 89,000 ships in convoys, and the Navy claims not a single ship was lost while under airship protection. Though their visible presence was credited with deterring attack upon the ships under their care, it also made it almost impossible for them to attack a submarine. One blimp, however, the K-74, did find a surfaced submarine at night in the Gulf of Mexico. The blimp attacked, but was shot down by the submarine after the airship's depth-charge releases failed to function.

The "art and science" of airship operations continued to develop during the 1950s.

On 4 March 1957, a ZPG-2 class ASW airship, nicknamed "Snow Bird," took off from Naval Air Station, South Weymouth, Massachusetts. It remained airborne for 264 hours (11 days) and covered over 9,400 miles *without refueling*! During the course of the record-setting flight, the airship crossed the Atlantic twice.

In July 1958, the Navy first flew a ZPG-3W-class airship, which remains the largest non-rigid airship ever to fly. The ship, the first of four sisters, was over 400 feet long and was supported by 1.5 million cubic feet of lifting gas. Intended to provide early warning of incoming Soviet bombers, it carried a 40-foot search radar antenna *inside* the envelope, and was designed for missions of 80 hours' endurance.

By the early 1960s, however, the advent of the Soviet intercontinental ballistic missile caused a shift away from a concentrated effort to defend the continental United States from a massive attack by long-range Soviet bombers, and the ZPG-3Ws were retired from service. In October 1961, the Navy's last antisubmarine airship units, Airship Patrol Squadrons One and Three, were disestablished.

An Idea Whose Time Has Come . . . Again!

In the past 8-10 years, dozens of articles and stories have appeared in the popular press, describing new rigid airships as large as 2,000 feet in length. A proposal has been put forward by Boston University Professor Francis Morse for a nuclear-powered airship with a ballroom at the top of the airship and room for 400 passengers!

While these concepts are interesting exercises in speculation, they do little to promote a realistic understanding of the near-term potential of reasonably sized airships.

There are a number of government-funded research and development efforts currently in progress; as well as several serious proposals being evaluated by some of the nation's most highly regarded corporations.

Piasecki Heli-Stat

In one of the giant old airship hangars at the Naval Air Technical Training Center, Lakehurst, New Jersey, the Piasecki Aircraft Company is building a "heavy-lift" airship, the Heli-Stat, which combines the dynamic-lift of four helicopters with the

static lift of a one-million cubic foot airship envelope. The Heli-Stat will lift 20-25 tons, which is far more than the largest US-built helicopter can carry.

Construction of the first full-sized prototype is being funded by the US Forestry Service, which plans to use the craft to harvest huge trees from inaccessible areas where the construction of a standard logging "haul-road" to remove the felled timber is either too expensive or is environmentally destructive. Assembly of the airship is underway and while a number of problems have recently emerged, a 1983 maiden flight is still planned.

The US Navy is interested in seeing if the "heavy-lift airship" is practical for off-loading containerized cargo and large vehicles from ships at sea.

The Goodyear Aerospace Corporation has done extensive research on a proposed heavy-lift vehicle capable of lifting 70 tons or more. Data from both the Piasecki and the Goodyear studies indicates a role for a hybrid lighter-than-air craft that cannot be filled by any other technology.

Maritime Patrol Airship

In March 1980, the Naval Air Development Center in Warminster, Pennsylvania, released the results of the two-year long Maritime Patrol Airship Study, which was carried out under the sponsorship of the Coast Guard and the Navy to determine the usefulness of modern airships to the Coast Guard.

It concentrated on how well a modern airship could perform those Coast Guard missions, eight in number, which could reasonably be identified as potential airship undertakings.

These are:

1. Short-Range Aids to Navigation
2. Enforcement of Laws and Treaties
3. Marine Environment Protection
4. Military Operation Preparedness
5. Marine Science Activities
6. Port Safety and Security
7. Search and Rescue
8. Ice Operations

The report concluded that, on the basis of a first-order analysis, airships appear to be economical and useful in support of all mission areas investigated. They were determined to be energy efficient and both technically and operationally practical.

As the next step in analyzing the potential of the Maritime Patrol Airship, in November 1981, the Coast Guard issued a request for proposals for the design and construction of a test vehicle. A cut in Coast Guard financial resources caused the request to be cancelled. The concept, however, is far from dead, and the Goodyear Aerospace Corporation, owners of the famous blimps, took it upon themselves to fund a series of tests using one of their own advertising airships. The *Enterprise*, one of four blimps operated by Goodyear, was equipped with a Litton Systems Canada Ltd. APS-504(V)2 maritime patrol radar. Operating from her home base in Pompano Beach, Florida, the airship carried out patrols over the Florida Straits for three weeks, working in conjunction with the 95-foot cutter USCGC *Cape Shoalwater*. The Coast Guard and Customs Service provided observers. A Coast Guard spokesman stated that the platform was stable for its purpose and offered good on-station endurance.

A full analysis of the test operation is still being conducted by Goodyear Aerospace.

Airship Industries SK-500

In September 1982, the annual Farnborough Air Show in England had two star attractions: Rockwell International's flying prototype of the B-1 bomber, and Airship Industries' Skyship-500 nonrigid airship. The British-built airship featured a control-car built from lightweight composite materials and ducted-fan propellers which can be rotated downward to provide additional lift at takeoff and improved flight control at low speeds.

A "sister-ship" to the SK-500 which flew at Farnborough has been leased by the US Navy for a series of tests to be conducted in the United States early this year. Major components have been airlifted from England to an assembly hangar in Toronto, Canada. Following assembly and preparation in Canada, the airship will be flown to the Naval Air Development Center in Warminster, Pennsylvania and to the Naval Air Test Center, Patuxent River, Maryland for a series of Navy and Coast Guard demonstration flights. The SK-500 will be equipped with a British-built Sea Searcher radar, and the test program will examine the ship's flight characteristics, endurance, and capability to detect surface and air targets. A follow-on series of tests with a towed-array sonar system has been discussed.

High-Altitude Surveillance Platform for Over-the-Horizon Targeting "Hi-Spot"

The Lockheed Missiles and Space Company recently issued the final report on their Navy-funded study on a high-altitude drone airship designed to operate at over 70,000 feet for extended periods. Lockheed engineers designed a 500-foot non-rigid airship carrying 5 million cubic feet of helium. (By comparison, the Goodyear blimp *America* is 192 feet in length with a gas volume of 200,000 cubic feet.) The Hi-Spot would be able to fly from its base to a surveillance station up to 6,000 miles away, and then remain on station at 70,000 feet for up to 45 days. It would then be flown back to base where it would be serviced and readied for the next mission.

Such a system would provide a cheap, reusable, and easily relocatable surveillance platform which could perform many of the tasks now assigned to expensive orbiting satellites. Armed with a wide variety of sensors, the Hi-Spot could provide a vantage point for observing military operations over hundreds of miles of land or ocean area. During last spring's naval campaign in the Falkland Islands, a Hi-Spot could have provided its owner with significant information regarding the movement of hostile ships, troops, and aircraft.

Funds are being sought to build a small test model to further examine the capabilities of such a system.

Tethered Aerostats

One "family" of LTA platforms has already moved from the drawing board to actual commercial and military operations. Tethered aerostats are unmanned blimp-shaped balloons which, like World War I "Caquot" observation balloons, are tied to the ground by strong cables. Since the late 1960s, TCOM Corporation, a subsidiary of the Westinghouse Corporation, has operated large tethered aerostats as

television-signal relay facilities, and systems are now in use in Korea, the Bahamas, and Africa.

On the military side, the US Air Force currently uses a 250,000 cubic foot aerostat to carry a balloon-borne radar system. The project, known as "Seek-Sky-Hook" provides a cost-effective "radar-barrier" across the Florida Straits. After a set period of operation, the aerostat is winched to the ground, serviced, and sent back aloft. A recent decision was made to establish another "Sky-Hook" radar system in Southern Florida to detect low-flying aircraft attempting to smuggle drugs into the country.

The US Customs Service has ordered a smaller radar-carrying aerostat of approximately 19,000 cubic feet capacity which can be transported by truck and operated by a team of two to three men. ILC-Dover Corporation is building the system, which will be able to cover different air corridors on successive nights, thus increasing the likelihood of intercepting drug smugglers. TCOM has begun marketing a 25,000 cubic foot aerostat system it calls STARS (Small Tethered Aerostat Relocatable System), which is capable of supporting up to 300 pounds of sensors or communications equipment at 2,500-3,000 foot altitudes.

The history of lighter-than-air craft is filled with both triumph and tragedy. In the 1920s and 1930s, airships were able to cross oceans at a time when conventional aircraft were barely able to cross county lines. For a time commercial transoceanic travel was solely the province of the airship, and until World War II brought about the development of long-range aircraft, the airship's place in commercial aviation was secure.

If airships are again to contribute to world aviation they will have to demonstrate that they can perform effectively, efficiently, and safely. They are not the answer to every aviation problem and should not be seen as "magical" platforms able to undertake any mission. They should be studied carefully, however, as more than frivolous relics from the past.

Lieut. Cdr. Jackson is on the faculty of the Naval War College.

